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INTELLIGENCE MEMORANDUM

MAJOR TELECOMMUNICATIONS GOALS OF THE SOVIET SIXTH FIVE YEAR PLAN (1956-60)

CIA/RR IM-444

9 January 1957

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MAJOR TELECOMMUNICATIONS GOALS OF THE SOVIET SIXTH FIVE YEAR PLAN (1956-60)*

Summary and Conclusions

Increasing economic investments are being made in telecommunications in the USSR to satisfy more exacting demands for specialized service capacities, for absolute reliability and instantaneous readiness of service, and for total security.

The Soviet Sixth Five Year Plan (1956-60) is far more comprehensive and ambitious concerning the construction of communications facilities than previous Plans, and it appears to point toward the overcoming of several obvious, longstanding telecommunications vulnerabilities. It is believed that the successful completion of the Plan will also materially increase telecommunications support for military purposes.

It is estimated that the Soviet Sixth Five Year Plan will entail capital investments of about 8 billion rubles in telecommunications plant and equipment for its basic civil system. Consumption expenditures by the public are estimated to be about 35 billion rubles for the purchase, licensing, and rental of radio and television broadcast reception facilities. Both of these outlays for investment and consumption appear to be within Soviet capabilities. It is concluded that the announced goals of the Sixth Five Year Plan for telecommunications are feasible.

I. Announced Objectives.

The program for expansion and improvement of telecommunications services in the USSR under the Sixth Five Year Plan (1956-60) emphasizes, in general terms, modernization in the European USSR and

* The estimates and conclusions contained in this memorandum represent the best judgment of ORR as of 15 November 1956.

Western Siberia to a level approaching that of Western Europe and modernization in Central and Eastern Siberia to the level recently prevailing in the European USSR. The announced major goals include the following 1/*:

1. The establishment of a network of potentially high-capacity** trunklines by installing not less than 10,000 kilometers (km) of microwave radio relay lines and by laying twice as much underground high-capacity (including coaxial) cable as was laid during the Fifth Five Year Plan (1951-55).

2. An increase in the number of major television transmitting stations from 11 (at the end of 1955) to 75 (at the end of 1960) and the linking of a number of these stations into a network for the relaying of television programs. These television transmitting stations are to be located in all republic capitals and major cities.

3. An increase in the number of television receivers from approximately 800,000 at the end of 1955 to 8 million in 1960, thus providing television service to approximately 25 million to 30 million viewers.

4. An increase by 90 percent in the total power of the radiobroadcasting transmission network*** and the introduction of very-high-frequency (VHF), frequency modulation (FM) broadcasting in the European USSR.

5. The completion of geographical coverage of the USSR with aural radiobroadcasting reception facilities by means of wire-diffusion

* For serially numbered source references, see the Appendix.
** High capacity denotes telecommunications cable or radio relay systems having a capacity of from several hundred to as high as 3,600 telephone channels. Telephone channel capacity denotes the number of telephone conversations which can be carried simultaneously between two points. Up to 24 two-way telegraph channels can be derived from one telephone channel. For the transmission of television programs of acceptable picture quality, a capacity equivalent to 450 telephone channels is required. The same radio relay or coaxial cable facilities which transmit television programs can be diverted to, time-shared with, or shared by telegraph, telephone, and facsimile services, depending upon the total capacity of a specific link.
*** This figure may apply to increases in the number and power of wire-diffusion centers or radiobroadcasting transmitters or both.

loudspeakers (radiofication) and with independent receivers by an increase in reception units from 25 million to 67 million.

6. An increase in the capacity and speed of telegraph service through automation and mechanization of operations and in subscriber (leased) service by four times.

7. The wide extension of phototelegraphic (facsimile) service through an increase of facsimile apparatus by five times.

8. An increase in the aggregate length of interurban telephone channels by almost 2.5 times compared with 1955. The aggregate length of such channels connecting Moscow with the Far East and Eastern Siberia is to be increased by more than 7 times, with Western Siberia and the Urals by 5 times, and with the Central Asian republics* by 3 times.

9. An increase in the total capacity of city telephone exchanges by 40 percent.

10. An increase in the number of subscribers to the intrarayon communications "of general use"** by 33 percent.

Recently published Soviet statistics on telecommunications services in the USSR tend to support US intelligence estimates that the basic civil wire system has been one of relatively low capacity. 2/ As is shown in the accompanying map (Figure 1***), this network consists chiefly of open wire, with carrier equipment on many routes permitting simultaneous operation of as many as 15 telephone channels. Some relatively short cable lines complete the wire network. This wire-line system is supplemented by a few short microwave radio relay routes and by a network of high-frequency, long-distance radio communications stations.

This telecommunications system has apparently served the minimum peacetime needs of the USSR thus far, but it is patently antiquated in terms of world technological progress. The need for expanded, more efficient facilities -- in terms of standardization, capacity, speed, flexibility, reliability, accuracy, and security -- to satisfy post-World War II needs has been and is increasing significantly. The need

* For the purposes of this memorandum the term Central Asian republics refers specifically to Kazakh, Kirgiz, Tadzhik, Turkmen, and Uzbek SSR's.
** The exact meaning of the term of general use is not known.
*** Following p. 4.

for expansion and modernization has been underscored by the accelerating growth in industry and agriculture, in government control structure and techniques, in civil defense requirements, and in military demands generally.

The goals of the Sixth Five Year Plan indicate that the USSR is taking decisive steps toward achievement of a telecommunications system commensurate to its current and future needs.

II. Trunklines.

The most important goal for telecommunications services in the Sixth Five Year Plan is the expansion of the trunkline system through the installation of at least 10,000 km (6,000 miles) of microwave radio relay lines and the increase of coaxial cable routes by approximately 2 times.

A. Routes.

The reported routes of the microwave radio relay lines are shown on the map (Figure 1*). These are the routes announced in Soviet press, radio, and technical journals, with the exception of the route from Kuybyshev to Tashkent, which has been assumed on the basis of existing facilities and geographic considerations. By rough calculation of airline distances, the routes total approximately 9,000 km (5,400 miles). Inasmuch as actual route distances would be somewhat greater than airline distances, it is probable that these routes approximate the total projected under the Plan.

None of the planned coaxial cable routes has been revealed. It is probable that these routes will be located west or southwest of Moscow and will interconnect major cities in those portions of the USSR and the European Satellites.

B. Microwave Radio Relay Lines.

Soviet announcements concerning the Plan are specific that the microwave radio relay line from Leningrad to Tallin-Riga-Vil'nyus-Minsk, which will serve to relay television programs, will be completed in 1958 3/; that operation of a similar line between Yerevan, Tiflis, and Baku will begin in 1957; and that television programs will be relayed to those points from Moscow, Leningrad, and other cities in 1960. 4/ A

* Following p. 4.

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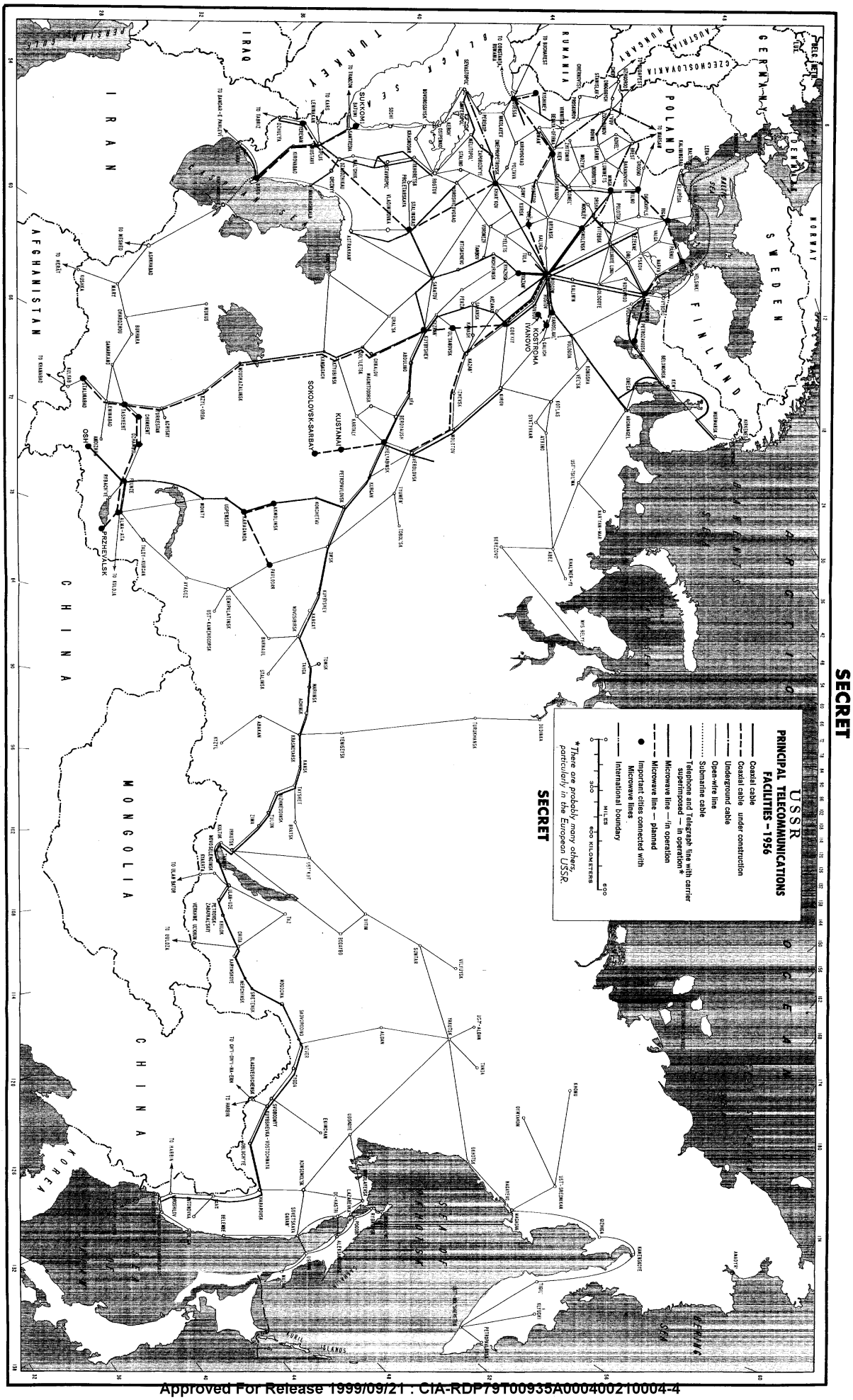

third route -- from Moscow to Gor'kiy continuing eastward to Sverdlovsk and from Gor'kiy southeastward presumably by way of Kuybyshev to Tashkent -- also has been announced, but no date has been given either for its commencement or for its completion. Relay of television programs from Moscow to Tashkent, however, is promised during the Plan. 5/ An announcement in connection with Radio Day (7 May), 1956, stated that "at present work is going on in connection with designing these lines in southern and eastern directions." 6/

Announcements have been made that a number of the planned microwave radio relay lines will be employed for 24-channel telephone service and for relay of television programs. Publicity attendant upon the announcements of the telecommunications goals of the Sixth Five Year Plan and the celebration of Radio Day heavily stressed research and development and the use of mass-production methods in manufacturing the equipment necessary to achieve the announced goals. Reports from the USSR, East Germany, and Hungary indicate that research and development of equipment for high-capacity utilization of long-distance lines is presently under way. 7/

C. Coaxial Cable.

Either microwave radio relay or coaxial cable facilities are a requisite for relaying television programs over long distances. The coaxial cable from Moscow to Leningrad is reported to be a nonstandard type with a capacity of 250 telephone channels. Some improvements have made possible the transmission of television programs along this cable from the Moscow television center to Kalinin, a distance of about 140 km (84 miles). 8/ This relay of television programs has been announced as the first in the USSR.

Other underground high-capacity cables have been reported to radiate from Moscow toward the western periphery, probably by way of Minsk or Kiev, to Satellite capitals and toward the Black Sea area. The fact that no television programs have been relayed to existing stations west or southwest of Moscow suggests that cable facilities in these areas are not of the coaxial type.* The use of coaxial cable in the future for exchange of television programs with Czechoslovakia is given some credence by the recent conference on that subject between Czechoslovak and Soviet communications officials. 9/ The possibility

* This absence of television network service also implies that microwave media are likewise not available for such service.

exists, however, that a Czechoslovak coaxial cable may be connected to a Soviet microwave link in order to relay television programs between the two countries.

III. Television.

The widespread expansion of television broadcasting in the USSR is the second most significant aspect of telecommunications goals in the Sixth Five Year Plan.

A. Television Transmission Base.

The television transmission base will comprise three types of stations, which for the purposes of this report are designated as follows: (1) major television stations that originate programs and in many instances participate in network exchange of programs, (2) relay television stations that extend the immediate area of coverage of a major television station, and (3) local television stations which may either originate or relay programs but which operate on a very small scale.

The Ministry of Communications owns and operates the major stations and the relay stations. Local stations are owned and operated by groups of television amateurs and research institutes, local enterprises, and other ministries. Information on the expansion of television service under the Sixth Five Year Plan is concerned primarily with the development of the major and relay stations. The establishment of local television stations may be encouraged for areas that are not included in the Plan for the Ministry of Communications.

All three types of television stations, to be operational by the end of 1960, will total 127. The accompanying map (Figure 2*) shows the locations of 123 of these stations; the locations of the remaining 4 stations have not been determined.

1. Major Television Stations.

At the end of June 1956 there were 12 major television stations in regular operation in the USSR. 10/ This number is to be increased to 20 by the end of 1956, to 44 by the end of 1958, and to 75 by the end of 1960. 11/

* Following p. 6.

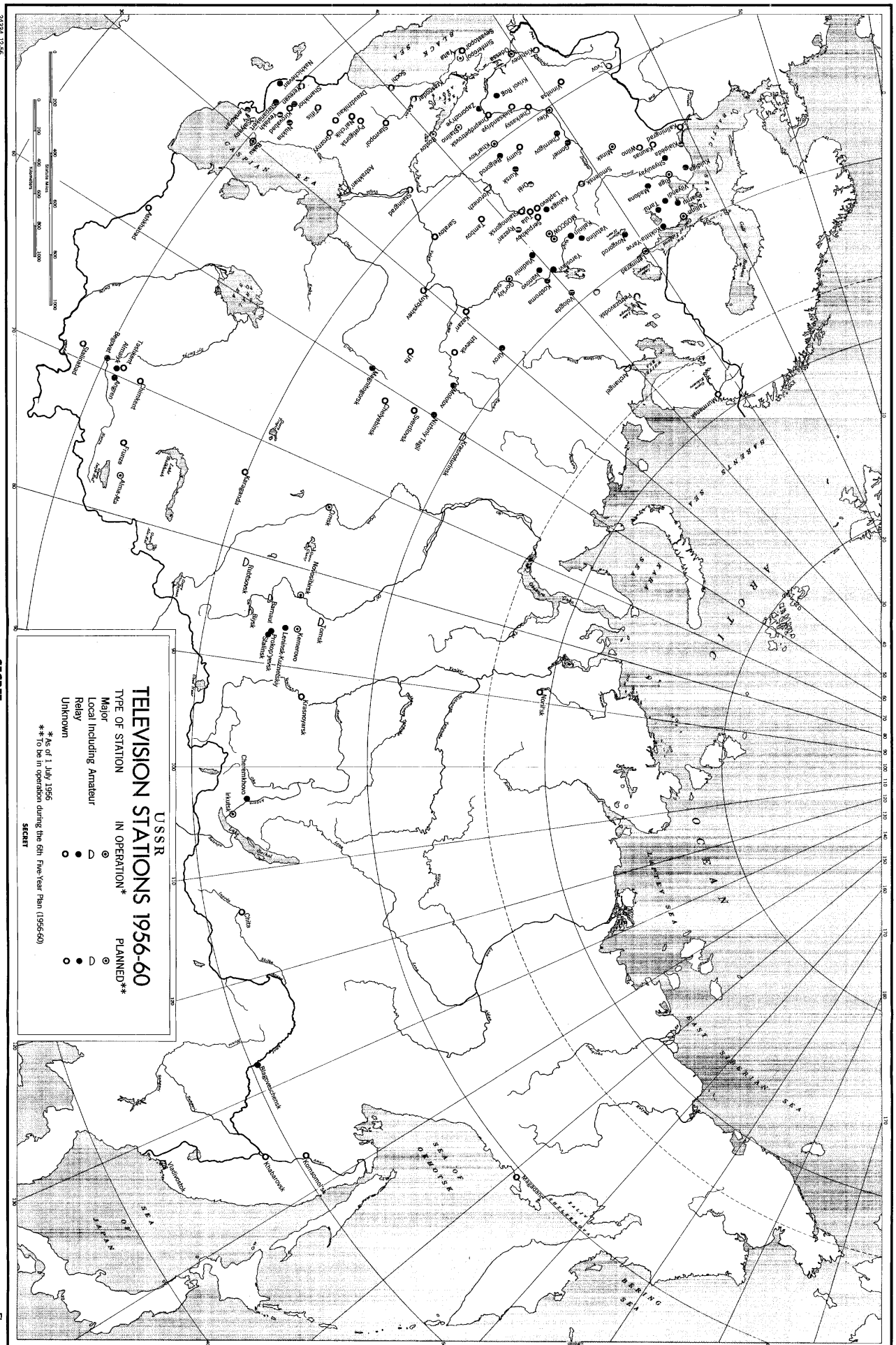

Figure 2

2. Relay Television Stations.

In order to extend the service area of the major television stations, one or more automatic relay stations may be located within a radius of 100 to 120 km from the major station. In June 1956 there were 4 such relay stations in operation in the USSR, and it is planned to increase this number to 180. 12/ The time limit for the establishment of all 180 stations was not announced in connection with the Plan, but at least 44 such stations are to be in operation by the end of 1960. 13/

3. Local Television Stations.

Three local television stations are in operation in the USSR, and at least eight are planned for operation by the end of 1960. 14/

B. Color Television.

At present, television transmission in the USSR is in black and white only. The Sixth Five Year Plan calls for the introduction of color television within the next 3 years. 15/ Color television is still in the early stages of development in the USSR, however, and the Plan announcements give no indication of the extent of its operation, if any, by the end of 1960. Collaboration by the USSR, Czechoslovakia, and East Germany on research in color television techniques is reportedly taking place.

C. Mobile Auxiliary Equipment.

The use of mobile television transmitters for remote program pickup is employed in connection with the television stations in Riga, Moscow, Leningrad, and Kiev. 16/ It is intended eventually to have mobile pickup equipment associated with each station that originates programs. The Sixth Five Year Plan does not specify the number of such transmitters to be in use during the Plan period, but it points up the desirability of their introduction "as soon as possible." 17/

D. Television Reception Base.

The planned expansion in television broadcasting stations in the USSR is to be accompanied by a corresponding expansion in the television reception base. The total number of receivers will be increased from 800,000 at the end of 1955 to over 8 million by the end

of 1960 to serve an audience of 25 million to 30 million viewers. This audience averages less than four viewers per receiver, which appears low in relation to family composition and living conditions in the USSR. The nature of the economy of the USSR, however, and its income distribution pattern may explain this low average.

IV. Aural Broadcasting.

A. Transmission Base.

The aural broadcasting service will be expanded to reach virtually the entire population of the USSR by 1960. According to a Soviet announcement, this is to be accomplished by expansion of the transmission base, in terms of total power, by an increase of 90 percent. The precise meaning of "increase in total power" is obscure. It probably includes the power of new transmitters and increases in the power of existing transmitters of all types of broadcasting stations, including the relay centers of the wire-diffusion network.

FM broadcasting is to be employed in the densely populated areas of the European USSR, especially near the western border. FM stations are now in operation in Moscow, Leningrad, Riga, Kiev, and Khar'kov. A minimum of 63 FM stations is planned to be operational by the end of 1960. 18/

Amplitude modulation (AM) broadcasting facilities are to be expanded primarily in the Far East, Central Asia, and the North -- areas of relatively low population density which require transmission facilities suitable to extensive geographical coverage.

The number of relay centers of the wire-diffusion system is to be doubled, from 30,000 in 1955 to about 60,000 by the end of 1960. 19/

B. Reception Base.

The reception base for aural broadcasting in the USSR is to be increased from 25 million units (6 million independent receivers and 19 million wired loudspeakers) to 67 million units (32 million independent receivers and 35 million wired loudspeakers). 20/ The addition of about 25 million broadcast (AM or FM) receivers will, it is estimated, mainly comprise AM receivers, including many new designs provided with shortwave bands.

There are very few FM radio receivers in operation in the USSR, and most of these are incorporated in television receivers. The task of development and production of these receivers is included in the Sixth Five Year Plan. Converters to permit FM reception with existing AM receivers are also under development. 21/

The estimated annual growth of television and aural broadcasting reception facilities in the USSR in 1955-60 is shown in the accompanying chart (Figure 3*).

The increase in aural reception facilities represents about $2\frac{1}{2}$ times the number in service at the close of 1955. This will average 1 reception unit to approximately every 3 persons in the USSR.

V. Telegraph Service.

Telegraph service in the USSR is far more extensive both in terms of geographic coverage and volume of traffic than long-distance telephone service. There has been considerable improvement in speed and quality of service through modernization of equipment and improvement in qualifications of operating personnel during the post-World War II period. Notwithstanding these improvements, the system in general is not up to the level of modern technical developments in other parts of the world. 22/ In 1955, about 60 percent of the telegraph equipment consisted of outmoded, relatively inefficient Baudot and Morse equipment.** 23/

The Sixth Five Year Plan goals to increase capacity and speed of service through automation and mechanization of operations appear to hinge on the successful development and production of modern high-speed multichannel terminal equipment and teletype equipment. As an interim measure, existing equipment is to be modernized as far as practicable. 24/ In addition, many small, time-consuming manual operations such as stamping, sorting, and packaging telegraph blanks will be mechanized. 25/

The planned increase in subscriber telegraph service by four times also appears to depend on the development and production of a small subscriber telegraph exchange with a capacity of 10 to 20 lines and upon provision for automatic connection to a subscriber telegraph net. 26/

* Following p. 10.

** Morse is manual or machine telegraph equipment involving the original telegraph code. Baudot is machine telegraph equipment involving group signals.

In general, the Plan calls for increasing the amount of phototelegraphic apparatus by five times. No information is available on the quantities of apparatus which will be produced and/or placed into operation during this Plan period or on the increase in traffic expected to be derived. By admission of Soviet officials, "the most appalling backwardness in telegraph apparatus is observed in the field of phototelegraphy." 27/ Although considerable work was done on development of phototelegraph apparatus during the Fifth Five Year Plan, further efforts are called for in the Sixth Five Year Plan to complete the development of equipment suitable for wide-scale use. Work on the development of electron-ray types of high-speed apparatus and small-sized apparatus with open recording will be stressed. Development of apparatus for automatic relaying of phototelegrams also must be completed. 28/

VI. Telephone Service.

A. Intercity (Long-Distance) Service.

The increase in aggregate length of intercity telephone channels in the USSR by almost $2\frac{1}{2}$ times compared with 1955 probably takes into account newly constructed routes and increased channel capacity on existing routes. The total length of telephone channels in the USSR is not known. Nevertheless, an over-all increase of $2\frac{1}{2}$ times represents a marked buildup in facilities.

The map (Figure 1*) shows that the microwave relay lines announced under the Plan end with a concentration in the Central Asian republics. Any use of microwave relay facilities farther east will probably, in the early stages, consist of links of low capacity integrated with wire lines and employed over terrain where construction and maintenance of wire lines are impracticable. It is probable that the announced increase in telephone channel capacity to the Far East by more than seven times will result from installation of new wire-line routes and the use of carrier equipment on open wire to increase capacities of both new and existing routes.

B. City Service.

The estimated capacity and degree of automatic service of the urban telephone systems in the USSR in 1955 and the planned increase in this capacity by 1960 are shown in Table 1. **

* Following p. 4, above.
** Table 1 follows on p. 11.

USSR
Estimated Radio and Television Broadcast Reception Facilities in Use
(in millions)
1955-60

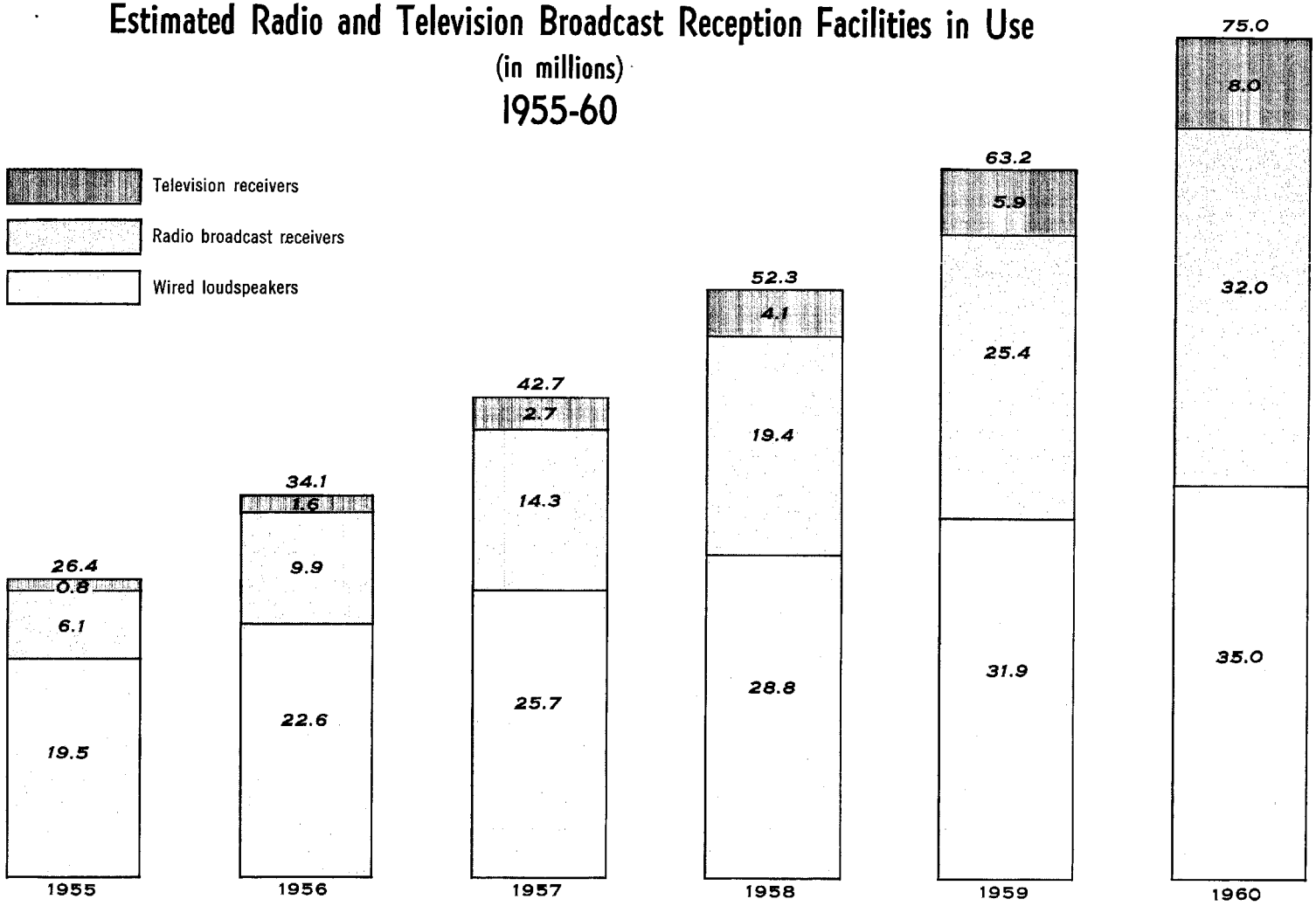

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Figure 3

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Table 1

Estimated Capacity and Planned Increase in Capacity of Urban Telephone Systems in the USSR 1955 and 1960

Type of Exchange	Telephone Numbers Available (Thousands)		Increase 1960 over 1955 (Percent)
	1955	1960	
Automatic	900	1,500	67 a/
Manual	900	1,000	11
Total	1,800	2,500	39

a. Some Plan announcements have stated that a 90-percent increase in urban automatic telephone exchange capacity is planned in 1956-60. Derived absolute data indicate that this 90-percent figure may be in error and that the 67-percent increase shown in this table represents the best estimate of the probable increase in urban automatic telephone exchange capacity during the Sixth Five Year Plan.

During the Fifth Five Year Plan, total urban telephone capacity was increased by 35 percent and automatic telephone exchange capacity by about 58 percent. 29/ During the Sixth Five Year Plan, total urban exchange capacity will increase by about 40 percent. 30/ It is estimated that this increase will be reflected in an increase in automatic exchange capacity of about 67 percent and an increase in manual exchange capacity of about 11 percent. Thus the Sixth Five Year Plan shows an increased rate of expansion over the Fifth. As the percentage increases are applied to a larger base than the percentage increases of the Fifth Five Year Plan, the absolute planned increase is substantially larger than that of the Fifth Five Year Plan. The expansion in city telephone service does not appear to be out of line in relation to the over-all planned growth of telecommunications services during the Sixth Five Year Plan.

The Sixth Five Year Plan calls for the installation of automatic urban telephone exchanges in the telephone systems of 70 cities that have manual exchanges at present. By the end of 1960 it is planned to have automatic exchanges operating in about 110 cities in the USSR, compared with about 40 in 1955. 31/

C. Intrarayon Communications Service.

Intrarayon communications service on a wide scale is a comparatively recent addition to the telecommunications network of the USSR. From the sparse information available about this service, it appears to be somewhat comparable to rural telephone service. Wire lines are usually employed, but radio is employed in some cases. There is insufficient information available to allow evaluation of the announced increase of 33 percent in subscribers of general use.

VII. Financial Considerations.

A. Capital Investment.

The estimated capital investment for telecommunications facilities in the USSR in 1956-60 is shown in Table 2 and will entail a capital investment of approximately 8 billion rubles for the items listed. This estimate is very tenuous, as many of the aims of the

Table 2

Estimated Capital Investment for Telecommunications Facilities in the USSR
1956-60

	Million 1955 Rubles
Television	1,700
Radiobroadcasting and wire diffusion	3,000
Telephone and telegraph	800
Microwave radio relay	400
Wire line and cable	400
Local communications	400
Allowance for other investments	1,000
Total	7,700

Plan have been expressed in units not directly correlated with the expansion of specific facilities. Furthermore, the character and nature of the facilities are not readily determinable from available information. Thus the estimates of specific investments are arbitrary in many cases and are based on assumed levels of quality of service which may or may not be met. It is estimated, therefore, that the margin of error of the figure of 8 billion rubles is at least plus or minus 25 percent.

There are two primary sources of funds for capital investment by the Ministry of Communications in the USSR -- funds allocated from the All-Union budget for capital investment purposes and funds accumulated at the local level from profits of enterprises, amortization deductions, and other local sources. It is probable that the capital investment requirements estimated to be necessary to achieve the planned goals for expansion of the telecommunications system of the USSR under the Sixth Five Year Plan can be met.

B. Consumer Expenditures.

The planned expansion in reception facilities for radio and television broadcasting under the Sixth Five Year Plan will cost Soviet consumers an estimated 35 billion rubles. This will be composed of outlays estimated at 20 billion rubles for the purchase of radio and television receivers and 15 billion rubles in addition for license or rental fees for radiobroadcast and television receivers and wired loudspeakers. The estimated consumer expenditures for telecommunications in the USSR in 1956-60 are shown in Table 3.*

VIII. Status of Telecommunications in 1960.

Publicity attendant upon the announcements of telecommunications goals in the Sixth Five Year Plan and on Radio Day, 1956, heavily stressed research and development and the use of mass-production methods to manufacture equipment necessary to achieve the goals. Time periods normally required for development, production, distribution, and installation of complex telecommunications equipment are usually measured in terms of years rather than months. Soviet announcements that equipment to be placed into operation during the current Five Year Plan is yet in process of development and/or production suggest that during the earlier years of the Sixth Five Year Plan there will be little evidence that goals are being achieved except in the broadcast service.

* Table 3 follows on p. 14.

Table 3

Estimated Consumer Expenditures for Telecommunications in the USSR a/
1956-60

	Billion 1955 Rubles
Purchases	
Television receivers	12.2
Radiobroadcast receivers	7.7
Licenses and rental fees	
Television receivers	2.7
Radiobroadcast receivers	3.6
Wired loudspeakers	9.2
Total	35.4

a. These expenditures do not include consumer outlays for telephone and telegraph services.

It is probable that the basic installation of the microwave radio relay lines -- initially to be used for the relay of television programs and a relatively small number of telephone and/or derived telegraph channels -- will have been engineered so as to permit much higher capacity usage later as equipment for telephone, telegraph, and facsimile services becomes available. The early, widespread introduction of television will serve the dual purpose of satisfying a public desire for this modern medium of entertainment and increasing the propaganda and educational tools of the Soviet regime.

If the USSR achieves these goals, the status of its telecommunications system will be somewhat as follows at the end of 1960:

1. In terms of coverage, capacity, and physical-technical security, the USSR will have considerably improved its basic telecommunications trunkline resources in the European USSR and in the Central Asian republics.

2. The USSR will have provided a substantial transmission and reception base for television, which is generally conceded to be the most effective medium of mass communication.

3. The USSR will have completed aural broadcast service coverage of the entire country.

4. The USSR will have improved the diversity (in terms of kinds of media) and the capacity of its major trunk lines.

5. The USSR will have made some progress in automation of telecommunications services, thus improving speed and quality of service and reducing labor costs per unit of service.

6. To the above extent, the USSR will have improved the telecommunications support for its armed forces, air defense, and civil defense, because these priority users of communications facilities probably obtain a first share of new facilities and also can appropriate facilities used for civilian purposes.

7. The USSR will have further reduced dependence upon long-distance, point-to-point, interceptable, and jammable radio west of the Urals and possibly to a lesser extent east of the Urals along the Trans-Siberian Railroad. It will, however, continue to depend heavily upon long-distance, point-to-point, interceptable radio east of the Urals and north of the Trans-Siberian Railroad, where wire lines, cable, and microwave radio relay lines are sparse or nonexistent.

8. To the extent that wire-line, cable, and microwave radio facilities will be able to handle the bona fide traffic which was previously handled by long-distance, point-to-point radio facilities, these unused facilities in standby status will reduce Soviet vulnerability to communications disruptions growing out of natural catastrophes, sabotage, and war and/or be available for jamming purposes with lessened risk of self-jamming.

APPENDIX

SOURCE REFERENCES

The most useful type of source in the preparation of this memorandum consisted of official Soviet announcements as reported in the FBIS Daily Reports and FDD Summaries. The following list of source references provides detailed documentation for all estimates and judgments contained in this memorandum with the exception of the estimates in Tables 1, 2, and 3, which were derived by weighing and evaluating a large number of separate pieces of raw intelligence. The methodology and documentation for specific items are available in the appropriate branch of ORR. The map, Figure 1, is based upon a map prepared by the Signal Corps Intelligence Agency, US Army. Signal Corps data apply to lines in use through 1953.

Evaluations, following the classification entry and designated "Eval.," have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this memorandum.

No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

FOIAb3b1

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